

INTRODUCTION TO ADVANCED MANUFACTURING AND LOGISTICS

Introduction to Advanced Manufacturing and Logistics is a course that specializes in how people use modern manufacturing systems with an introduction to advanced manufacturing and logistics and their relationship to society, individuals, and the environment. Students apply the skills and knowledge of using modern manufacturing processes to obtain resources and change them into industrial materials, industrial products and consumer products. Students investigate the properties of engineered materials such as: metallics; polymers; ceramics; and composites. Students study six major types of material processes: casting and molding; forming; separating; conditioning; finishing; and assembling. After gaining a working knowledge of these materials, Students are introduced to advanced manufacturing, logistics, and business principles that are utilized in today's advanced manufacturing industry. Students gain a basic understanding of tooling, electrical skills, operation skills, inventory principles, MSDS's, chart and graph reading and MSSC concepts. There is also an emphasis placed on the flow process principles, material movement, safety, and related business operations. Students have the opportunity to develop the characteristics employers seek as well as skills that will help them in future endeavors.

- DOE Code: 4796
- Recommended Grade Level: Grade 9-12
- Recommended Prerequisites: None
- Credits: 1 credit per semester, maximum of 2 credits
- Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas

Application of Content

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences.

Content Standards

Domain – Manufacturing

Core Standard 1 Students evaluate principles of manufacturing to assess their role in manufacturing operations and processes in logistics.

Standards

- IML-1.1 Identify the basics of product design
- IML-1.2 Explain the concepts of engineering and its importance within manufacturing
- IML-1.3 Differentiate between the various types of materials and their applications
- IML-1.4 Develop an understanding of product processing and the equipment associated with it
- IML-1.5 Explain the significance of quality control within product manufacturing
- IML-1.6 Examine the steps and process of product assembly
- IML-1.7 Explore the range of technologies available within manufacturing as a whole
- IML-1.8 Summarize how materials can be processed using tools and machines

Domain – Materials Handling

Core Standard 2 Students examines material handling in warehouses and distribution centers for a clear understanding of moving a product.

Standards

- IML-2.1 Discuss material handling, storage, and shipping methods
- IML-2.2 Analyze visual design and appearance requirements for packages
- IML-2.3 Explain size, weight, and shape requirements for packaging
- IML-2.4 Identify material handling and storage equipment
- IML-2.5 Discuss layout plans for processing packages
- IML-2.6 Identify types of warehouses and distribution centers

Domain – Introduction to Logistics

Core Standard 3 Students evaluate the history and fundamentals of logistics to understand its relation to manufacturing.

Standards

- IML-3.1 Describe the history and relevance of logistics
- IML-3.2 Examine logistic systems used for the transportation of products and services
- IML-3.3 Define terms associated with the logistics, planning, and management industries
- IML-3.4 Recognize the need for material control planning
- IML-3.5 Explore the various options and methods available for shipping/transportation
- IML-3.6 Explore value added services to improve quality and efficiency
- IML-3.7 Recognize the importance of safety, products, and people

Domain – Basic Business Principles

Core Standard 4 Students analyze business principles to make and support manufacturing and logistics decisions.

- IML-4.1 Develop a strong understanding of profits and losses
- IML-4.2 Explore the practice of marketing and explain its relevance
- IML-4.3 Illustrate the various needs for finance
- IML-4.4 Discover accounting practices and explain why they are needed
- IML-4.5 Explain why there is a need for operations in logistics
- IML-4.6 Discuss and understand business structure within advanced manufacturing and logistics

Domain – Advanced Manufacturing

Core Standard 5 Students evaluate advanced manufacturing procedures to improve processes.

- IML-5.1 Develop an awareness of process flow principles
- IML-5.2 Acquire an understanding of systems
- IML-5.3 Compile basic machine operations skills
- IML-5.4 Practice essential mechanical skills
- IML-5.5 Build an understanding of tooling
- IML-5.6 Explore machining within manufacturing industry
- IML-5.7 Develop a strong understanding of different assembly processes
- IML-5.8 Differentiate between materials

- IML-5.9 Acquire basic electrical knowledge and skills
- IML-5.10 Establish fundamental pneumatic skills
- IML-5.11 Exercise basic skills within hydraulics
- IML-5.12 Demonstrate industrial maintenance skills for use in manufacturing

Domain – Using Logistics

Core Standard 6 Students apply and adapt skills within the field of logistics too improve operations.

- IML-6.1 Explore both macro and global levels of material movement
- IML-6.2 Explains the logistics, planning, and management industries at local, state, national, and international levels
- IML-6.3 Explain the importance of production planning and workflow within logistics
- IML-6.4 Recognize the need for production control
- IML-6.5 Develop an understanding of the principles of inventory
- IML-6.6 Explore continuous improvement to increase product quality
- IML-6.7 Understand MSDS's and explain why they are important within industry
- IML-6.8 Acquire basic skills of chart and graph reading
- IML-6.9 Develop a general understanding of shipping, receiving, and processes
- IML-6.10 Establish a global understanding of markets

Domain – Safety

Core Standard 7 Students incorporate workplace and tool safety to maintain a safe work environment.

- IML-7.1 Identify hazards and apply safety methods for working in manufacturing jobs
- IML-7.2 Identify rules and laws designed to promote safety and health in the transportation, distribution, and logistics environments
- IML-7.3 Demonstrate proper use of safety equipment

Domain – Career Opportunities

Core Standard 8 Students evaluate the education, training, and certification needed for careers in advanced manufacturing and logistics.

- IML-8.5 Examine advanced manufacturing and logistics occupations and the roles and responsibilities of each
- IML-8.6 Examine licensing, certification and credentialing requirements at the national, state and local levels for careers in advanced manufacturing and logistics
- IML-8.7 Research local and regional labor market and job growth information
- IML-8.8 Identify employers' expectations, appropriate work habits, ethical conduct, legal responsibilities, and good citizenship skills;
- IML-8.9 Demonstrate professional standards as required by business and industry

Process Standards

Common Core Literacy Standards for Technical Subjects

Reading Standards for Literacy in Technical Subjects 9-10

The standards below begin at grade 9 and define what students should understand and be able to do by the end of grade 10. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Key Ideas and Details

- 9-10.RT.1 Cite specific textual evidence to support analysis of technical texts, attending to the precise details of explanations or descriptions.
- 9-10.RT.2 Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- 9-10.RT.3 Follow precisely a complex multistep procedure when performing technical tasks, attending to special cases or exceptions defined in the text.

Craft and Structure

- 9-10.RT.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific context relevant to *grades 9-10 texts and topics*.
- 9-10.RT.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).
- 9-10.RT.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.

Integration of Knowledge and Idea

- 9-10.RT.7 Translate technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
- 9-10.RT.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a technical problem.
- 9-10.RT.9 Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

Range of Reading and Level of Text Complexity

- 9-10.RT.10 By the end of grade 10, read and comprehend technical texts in the grades 9-10 text complexity band independently and proficiently

Writing Standards for Literacy in Technical Subjects 9-10

The standards below begin at grade 9 and define what students should understand and be able to do by the end of grade 10. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Text Types and Purposes

- 9-10.WT.1 Write arguments focused on *discipline-specific content*.
- 9-10.WT.2 Write informative/explanatory texts, including technical processes.
- 9-10.WT.3 Students will not write narratives in technical subjects. *Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In technical, students must be able to write precise enough descriptions of the step-by-step procedures they use in their technical work that others can replicate them and (possibly) reach the same results.*

Production and Distribution of Writing

- 9-10.WT.4 Produce clear and coherent writing in which the development, organization, and

style are appropriate to task, purpose, and audience.

- 9-10.WT.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- 9-10.WT.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Research to Build and Present Knowledge

- 9-10.WT.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- 9-10.WT.8 Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation
- 9-10.WT.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

- 9-10.WT.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Career and Technical Student Organizations

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in a Career and Technical Student Organization, such as [SkillsUSA](#).